CLAIMS

1. An image processor for processing image data formed from an MPEG-coded data group led by an *I* or *P* picture and including a *B* picture, the apparatus comprising:

an auxiliary data acquiring means for acquiring a VBV (video buffering verifier) delay of the *I* or *P* picture and pre-acquiring a VBV delay (VBV_delay_N) of a next picture to be inserted next to a last picture;

a recording means for recording the coded image data to a predetermined recording area in a recording medium for each data group and recording the VBV delay acquired by the auxiliary data acquiring means to an auxiliary recording area provided for each data group,

the recording means recording the acquired VBV_delay_N to an auxiliary recording area for a next picture, provided correspondingly to a recording area for the next picture.

2. The apparatus according to claim 1, wherein:

the auxiliary data acquiring means acquires DTS (decoding time stamp) of the *I* or *P* picture and pre-acquires DTS of a next picture; and

the recording means records the acquired DTS to the auxiliary recording area and the DTS of the next picture to the auxiliary recording area for the next picture.

3. The apparatus according to claim 1, wherein the recording means records an end

point flag indicative of a last picture to the auxiliary recording area for the next picture.

4. The apparatus according to claim 1, wherein the auxiliary data acquiring means acquires the VBV-delay_N according to the VBV delay (VBV_delay_L) of an *I* or *P* picture in a last group including a last picture and a transfer time (FT) and display time (ET) of the last data group.

5. The apparatus according to claim 4, wherein the VBV_delay_N is VBV_delay_L + ET − FT.

6. The apparatus according to claim 4, wherein the auxiliary data acquiring means acquires the FT by calculating 90,000 × d/bit rate from the number of bits (d) and bit rate of the last data group.

7. The apparatus according to claim 1, further comprising a converting means for converting a bit occupancy in a VBV (video buffering verifier) buffer on the base of the VBV_delay_N written to the auxiliary recording area for the next picture.

8. The apparatus according to claim 7, wherein the converting means converts the bit occupancy into VBV_delay_N × Bit rate/90,000.

9. The apparatus according to claim 1, further comprising:

a calculating means for calculating an initial value of the bit occupancy in a VBV buffer on the basis of the VBV_delay_N read from the auxiliary recording area for the next picture on the recording medium;

a comparing means for making a comparison between the initial value of the bit

occupancy calculated by the calculating means with a target value of the bit occupancy; and

controlling means for controlling, on the basis of the result of comparison from the comparing means, the bit occupancy for allocation to each GOP (group of pictures) on to-be-encoded image data for the bit occupancy in the VBV buffer to shift to the target value.

10. The apparatus according to claim 9, wherein:

the comparing means determines a difference between the target and initial values of the bit occupancy; and

the controlling means controls the bit amount for allocation to each GOP on the basis of a result of division of the difference determined by the calculating means by the number of GOPs.

11. The apparatus according to claim 9, wherein the controlling means further allocates a bit amount allocated to each GOP to each of pictures included in the GOP correspondingly to the type of a picture.

12. The apparatus according to claim 9, wherein in case the initial value of the bit occupancy is smaller than the target value, the controlling means inserts, before the *I* picture, at least one copy picture representing a preceding picture repeatedly.

13. The apparatus according to claim 12, wherein in case the initial value of the bit occupancy is smaller than the target value R, the controlling means determines an initial value VBV_delay_S for a video encoder correspondingly to VBV_delay_N,

number of the insertion copy pictures (N), time of copy picture display (ET), and a time of copy picture transfer (FT).

14. The apparatus according to claim 13, wherein the controlling means calculates the VBV_delay_S on the basis of the following equation:

$$VBV\_delay\_S = VBV\_delay\_N + N \times (ET - FT)$$

15. The apparatus according to claim 12, wherein the number of insertion copy pictures (N) is:

$$N \geq (\text{Set value } R - VBV\_delay\_N)/(ET - FT)$$

16. The apparatus according to claim 10, wherein:

the comparing means reads a VBV delay (VBV_delay_I) of an *I* picture leading image data supplied from another electronic device and determines a difference between the VBV_delay_N and VBV_delay_I; and

the controlling means inserts at least one copy picture or stuffing byte before the *I* picture correspondingly to the difference.

17. The apparatus according to claim 16, wherein in case the difference between the VBV_delay_N and VBV_delay_I is smaller than zero (0), the controlling means inserts only stuffing byte, not any copy picture.

18. The apparatus according to claim 16, wherein in case the difference between the VBV_delay_N and VBV_delay_I is larger than zero (0), the controlling means inserts at least one copy picture and stuffing byte.

19. The apparatus according to claim 9, wherein in case the last picture recorded in

the recording medium is a *P* picture, the controlling means corrects the VBV_delay_N correspondingly to the sizes of a sequence header and GOP header.

20. The apparatus according to claim 1, further comprising an area recording means for recording, at an edition point on the recording medium where the data group is already recorded, a data group to be edited (Pack_V_h), and recording, before the Pack_V_h on the recording medium correspondingly to the bit occupancy of the VBV buffer, an insertion data group (EditPack_V_h) including a copy picture and/or stuffing byte for which an insertion auxiliary recording area (EditAUX_V_h) is provided,

in case the EditPack_V_h is existent at the edition point on the recording medium, the area recording means recording, before a new input data group (Pack_V_n) independently of the EditPack_V_h, an insertion data group (EditPack_V_h) including a copy picture and/or stuffing byte for which an insertion auxiliary recording area (EditAUX_V_h) is provided.

21. The apparatus according to claim 20, wherein the area recording means removes EditPack_V_n laid before the new input Pack_V_n before recording at the edition point.

22. The apparatus according to claim 20, further comprising:

a delay comparing means for reading, for comparison, VBV_delay_N recorded in the auxiliary recording area for the next picture and VBV delay (VBV_delay_n) recorded in the EditAUX_V_n; and

a delay controlling means for controlling the number of copy pictures forming the EditPack_delay_n or stuffing byte correspondingly to the result of comparison from the delay comparing means.

23. The apparatus according to claim 20, wherein the area recording means records, to the EditAUX_V_n, VBV_delay_n based on the stuffing byte forming the EditPack_V_n.

24. The apparatus according to claim 20, wherein in case the EditPack_V_h is formed from only a stuffing byte, the area recording means adds a PES header not including PTS and DTS to the stuffing byte.

25. The apparatus according to claim 20, wherein in case a copy picture is already existent in the recording medium, the area recording means records a flag for identifying the copy picture to the recording medium.

26. The apparatus according to claim 25, wherein the area recording means takes the top of the copy picture as an edition point.

27. The apparatus according to claim 20, wherein the area recording means functions to:

insert a copy picture and then a stuffing byte to the recording medium in case EditPack_V_h is formed from both a copy picture and stuffing byte; and

insert a copy picture and then a stuffing byte to the recording medium in case EditPack_V_n is formed from both a copy picture and stuffing byte.

28. An image processing method of processing image data formed from an

MPEG-coded data group led by an *I* or *P* picture and including a *B* picture, the method comprising the steps of:

acquiring a VBV (video buffering verifier) delay of the *I* or *P* picture and pre-acquiring a VBV delay (VBV_delay_N) of a next picture to be inserted next to a last picture;

recording the coded image data to a predetermined recording area in a recording medium for each data group and recording the VBV delay acquired in the auxiliary data acquiring step to an auxiliary recording area provided for each data group,

in the recording step, the acquired VBV_delay_N being recorded to an auxiliary recording area for a next picture, provided correspondingly to a recording area for the next picture.

29. The method according to claim 28, wherein:

in the auxiliary data acquiring step, there is acquired DTS (decoding time stamp) of the *I* or *P* picture and pre-acquires DTS of a next picture; and

in the recording step, the acquired DTS to the auxiliary recording area and the DTS of the next picture is recorded to the auxiliary recording area for the next picture.

30. The method according to claim 28, wherein in the recording step, an end point flag indicative of a last picture is recorded to the auxiliary recording area for the next picture.

31. The method according to claim 28, wherein in the auxiliary data acquiring step, there is acquired the VBV-delay_N according to the VBV delay (VBV_delay_L) of

an *I* or *P* picture in a last group including a last picture and a transfer time (FT) and display time (ET) of the last data group.

32. The method according to claim 31, wherein the VBV_delay_N is VBV_delay_L + ET − FT.

33. The method according to claim 31, wherein in the auxiliary data acquiring step, there is acquired the FT by calculating 90,000 × d/bit rate from the number of bits (d) and bit rate of the last data group.

34. The method according to claim 28, further comprising a converting step of converting a bit occupancy in a VBV (video buffering verifier) buffer on the base of the VBV_delay_N written to the auxiliary recording area for the next picture.

35. The method according to claim 34, wherein in the converting step, the bit occupancy is converted into VBV_delay_N × Bit rate/90,000.

36. The method according to claim 28, further comprising the steps of:

calculating an initial value of the bit occupancy in a VBV buffer on the basis of the VBV_delay_N read from the auxiliary recording area for the next picture on the recording medium;

making a comparison between the initial value of the bit occupancy calculated in the calculating step with a target value of the bit occupancy; and

controlling, on the basis of the result of comparison from the comparing step, the bit occupancy for allocation to each GOP (group of pictures) on to-be-encoded image data for the bit occupancy in the VBV buffer to shift to the target value.

37. The method according to claim 36, wherein:

in the comparing step, there is determined a difference between the target and initial values of the bit occupancy; and

in the controlling step, the bit amount for allocation to each GOP is controlled on the basis of a result of division of the difference determined in the calculating step by the number of GOPs.

38. The method according to claim 36, wherein in the controlling step, a bit amount allocated to each GOP is further allocated to each of pictures included in the GOP correspondingly to the type of a picture.

39. The method according to claim 36, wherein in case the initial value of the bit occupancy is smaller than the target value, at least one copy picture representing a preceding picture repeatedly is inserted before the *I* picture in the controlling step.

40. The method according to claim 39, wherein in case the initial value of the bit occupancy is smaller than the target value R, there are determined in the controlling step an initial value VBV_delay_S for a video encoder correspondingly to VBV_delay_N, number of the insertion copy pictures (N), time of copy picture display (ET), and a time of copy picture transfer (FT).

41. The method according to claim 40, wherein in the controlling step, there is calculated the VBV_delay_S on the basis of the following equation:

$$VBV\_delay\_S = VBV\_delay\_N + N \times (ET - FT)$$

42. The method according to claim 40, wherein the number of insertion copy

pictures (N) is:

$N \geq$ (Set value R − VBV_delay_N)/(ET − FT)

43. The method according to claim 37, wherein:

in the comparing step, there is read a VBV delay (VBV_delay_I) of an *I* picture leading image data supplied from another electronic device and determined a difference between the VBV_delay_N and VBV_delay_I; and

in the controlling step, at least one copy picture or stuffing byte is inserted before the *I* picture correspondingly to the difference.

44. The method according to claim 43, wherein in case the difference between the VBV_delay_N and VBV_delay_I is smaller than zero (0), there is inserted only stuffing byte, not any copy picture.

45. The method according to claim 43, wherein in case the difference between the VBV_delay_N and VBV_delay_I is larger than zero (0), there is inserted at least one copy picture and stuffing byte.

46. The method according to claim 36, wherein in case the last picture recorded in the recording medium is a *P* picture, the VBV_delay_N is corrected correspondingly to the sizes of a sequence header and GOP header.

47. The method according to claim 28, further comprising an area recording step of recording, at an edition point on the recording medium where the data group is already recorded, a data group to be edited (Pack_V_h), and recording, before the Pack_V_h on the recording medium correspondingly to the bit occupancy of the VBV

buffer, an insertion data group (EditPack_V_h) including a copy picture and/or stuffing byte for which an insertion auxiliary recording area (EditAUX_V_h) is provided,

in case the EditPack_V_h is existent at the edition point on the recording medium, in the area recording step, there being recorded, before a new input data group (Pack_V_n) independently of the EditPack_V_h, an insertion data group (EditPack_V_n) including a copy picture and/or stuffing byte for which an insertion auxiliary recording area (EditAUX_V_n) is provided.

48. The method according to claim 47, wherein in the area recording step, there is removed EditPack_V_n laid before the new input Pack_V_n before recording at the edition point.

49. The method according to claim 47, further comprising the steps of:

reading, for comparison, VBV_delay_N recorded in the auxiliary recording area for the next picture and VBV delay (VBV_delay_n) recorded in the EditAUX_V_n; and

controlling the number of copy pictures forming the EditPack_delay_n or stuffing byte correspondingly to the result of comparison from the delay comparing step.

50. The method according to claim 47, wherein in the area recording step, VBV_delay_n based on the stuffing byte forming the EditPack_V_n is recorded to the EditAUX_V_n.

51. The method according to claim 47, wherein in case the EditPack_V_h is formed from only a stuffing byte, a PES header not including PTS and DTS is added to the stuffing byte in the area recording step.

52. The method according to claim 47, wherein in case a copy picture is already existent in the recording medium, a flag for identifying the copy picture is recorded to the recording medium in the area recording step.

53. The method according to claim 52, wherein the top of the copy picture is taken as an edition point.

54. The method according to claim 52, wherein in the area recording step:

a copy picture and then a stuffing byte is inserted into the recording medium in case EditPack_V_h is formed from both a copy picture and stuffing byte; and

a copy picture and then a stuffing byte is inserted into the recording medium in case EditPack_V_n is formed from both a copy picture and stuffing byte.